

## CLAIMS

What is claimed is:

1. A method for modeling a physical radio environment about a base station (BS) to enhance wireless communications comprising:  
obtaining location data from a geographic data base; and  
obtaining data from a physical attributes data base associated with the location data provided by the geographic data base.
2. The method of claim 1 wherein the step of obtaining location data further includes obtaining attributes related to a physical location.
3. The method of claim 2 wherein the step of obtaining attributes further includes obtaining data relating to land formations such as hills, mountains, bodies of water, trees, manmade objects such as buildings, bridges and atmospheric attributes associated with the location data.
4. The method of claim 1 wherein the step of obtaining physical attributes associated with location data further includes modeling multipath characteristics.
5. The method of claim 4 wherein modeling multipath characteristics includes modeling delay spread energy, number of significant paths and their locations expressed as numbers or ranges and energies of the paths, large scale fading or shadowing loss and doppler shift.
6. A method for modeling a physical radio environment about a user equipment (UE) to enhance wireless communications, comprising:  
obtaining location data from a geographic data base; and  
obtaining data from a physical attributes data base associated with the location data obtained from the geographic data base.

7. The method of claim 6 wherein the step of obtaining location data further includes obtaining attributes related to the physical location data.

8. The method of claim 7 wherein the step of obtaining attributes further includes obtaining land formations such as hills, mountains, bodies of water, trees, manmade objects such as buildings, bridges and atmospheric attributes associated with the location data.

9. The method of claim 2 wherein the step of obtaining attributes associated with location data further includes modeling multipath characteristics.

10. The method of claim 9 wherein modeling multipath characteristics includes modeling delay spread energy, number of significant paths and their locations expressed as numbers or ranges and energies of the paths, large scale fading or shadowing loss and doppler shift.

11. A method for modeling a physical environment of a radio path between a base station (BS) and a user equipment (UE) to enhance wireless communications, comprising:

said BS obtaining location data from a geographic data base related to a region incorporating said radio path; and

said BS obtaining, from a physical attributes data base, physical attributes associated with said region.

12. The method of claim 11 wherein the step of obtaining location data further includes obtaining attributes related to said region.

13. The method of claim 12 wherein obtaining attributes further includes obtaining land formations such as hills, mountains, bodies of water, trees, manmade objects such as buildings, bridges and atmospheric attributes of said region.

14. The method of claim 1 further comprising:  
obtaining radio related attributes associated with said region.

15. The method of claim 14 wherein obtaining radio related attributes includes modeling multipath characteristics.

16. The method of claim 15 wherein modeling multipath characteristics includes modeling delay spread energy, number of significant paths and their locations expressed as numbers or ranges and energies of the paths, large scale fading or shadowing loss and doppler shift.

17. A method for modeling a physical radio environment about a base station to enhance wireless communications, comprising:

obtaining location data of a user equipment (UE) from a geographic data base; and

obtaining mobility information associated with a UE based on location data from the geographic data base.

18. The method of claim 17 wherein obtaining mobility information includes obtaining geo-coordinates, velocity, road topology along which the UE may be traveling including traffic lights and other traffic signals and signs and traffic density.

19. The method of claim 17 wherein obtaining location data further includes obtaining attributes related to a physical location.

20. The method of claim 19 wherein obtaining attributes further includes obtaining data regarding land formations such as hills, mountains, bodies of water, trees, manmade objects such as buildings, bridges and atmospheric attributes associated with the UE.

21. The method of claim 19 wherein obtaining attributes includes obtaining radio related attributes associated with the location data, including modeling multipath characteristics such as delay spread energy, number of significant paths and their locations expressed as numbers or ranges and energies of the paths, large scale fading or shadowing loss and doppler shift.

22. A method for modeling a physical radio environment about a user equipment (UE) to enhance wireless communications, comprising:

obtaining location data of a user equipment (UE) from a geographic data base; and

obtaining mobility information associated with the UE based on location data from the geographic data base.

23. The method of claim 22 wherein obtaining attributes includes obtaining radio related attributes associated with the location data, including modeling multipath characteristics such as delay spread energy, number of significant paths and their locations expressed as numbers or ranges and energies of the paths, large scale fading or shadowing loss and doppler shift.

24. A method for modeling application context at a base station, to enhance wireless communication, comprising:

examining an application currently in use; and

modeling application context based on the current usage.

25. The method of claim 24 wherein the step of modeling application context includes modeling a current data rate and quality of service (QoS) requirements.

26. The method of claim 24 wherein the step of modeling an application context further includes providing an estimated future data rate, and estimated quality of service (QoS) requirements.

27. The method of claim 24 wherein modeling application context includes modeling support for handling the application currently in use.

28. The method of claim 24 wherein the examining step includes determining if the current application is one of voice communication, web browsing, email, FTP, SMS, MMS, image transmissions and messaging.

29. The method of claim 28 wherein the application context includes modeling the amount of data generated based on speech characteristics and a voice compression algorithm currently in use when the current application is voice communication.

30. The method of claim 27 wherein modeling support for the current application includes providing coding and processing to support the current application.

31. The method of claim 24 further comprising selecting communication parameters responsive to the detected application.

32. A wireless network comprising:

a base station (BS) and a plurality of user equipments (UEs), the base station having a local modeler for modeling radio environment in a vicinity of the base station;

the plurality of user equipments (UEs) each having a radio environment modeler for modeling radio environment in the vicinity of each respective UE;

each of said UEs transmitting environment model data obtained locally to the base station; and

said BS having a cognitive controller for adjusting and/or selecting network operational parameters and/or UE operational parameters based on the environmental models obtained locally and from the UEs.

33. The network of claim 32 wherein selecting parameters includes selecting/adjusting one or more of transmitted power, coding methods, data rates, ARQ parameters, radiation pattern including beam shape, call admission policies, congestion control policies and queuing policies.

34. Apparatus for use by a network for wireless communication with at least one user equipment (UE) comprising:

a physical modeler for providing data regarding physical characteristics located between the network and the at least one UE; and

means for selecting and/or adjusting the techniques employed for transmitting information to the at least one UE over a physical radio environment in accordance with data provided by the physical modeler.

35. The apparatus of claim 34, comprising:

a mobility modeler which takes into account location velocity, road topology and traffic density of a UE for adjusting information transmitted to the at least one UE.

36. The apparatus of claim 34, comprising:

an application/user context modeler containing data including the application environment of the at least one user equipment and for predicting application environment in future time instance adjust information transmitted to the UE.

37. A wireless communication network having a base station (BS) and at least one user equipment (UE) comprising:

said BS having a physical modeler for controlling communication in accordance with physical characteristics located between the BS and the at least one UE; and

transmitting information to the at least one UE which has been adjusted in accordance with the physical characteristics encountered.

38. The network of claim 37 further comprising:

a mobility modeler which takes into account location, velocity, road topology and traffic density of a UE for adjusting information transmitted to the at least one UE.

39. The network of claim 37 further comprising:

an application/user context modeler containing data including the application environment of the at least one UE and means for predicting application environment in future time to adjust information transmitted to the UE.